



# How do Prosumers Use Graphical Variables to Communicate on Maps?

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## Extended Abstract

With the arrival of the Internet, not only did computational approaches to geospatial data filtering, data integration, automatisisation of user and object-orientated data change but, in addition, visualisation and communication of map production and use also change with improved support and increasing standardisation. Web maps and mobile maps created by prosumers (both producer and consumer) have multiplied with easy data access and increasing use of geographic information technology. Crampton (2009) points to an explosion of "spatial media", impacts that others discuss further (e.g. Fink 2011; Jekel et al. 2013). However, with the advent of Web 2.0 an increasing number of geo-disciplines use online mapping tools to fulfill their mapping desires and ambitions (Meng 2008). A new user type, the prosumer, a frequent user of online maps, but with a focus on creating static maps arose. There are many possibilities to record and visualise geodata using approaches, concepts and techniques from traditional cartography for prosumers. Many of the online tools widely used today (for example Carto, Mapbox, etc.) are designed to support easy map making. As the term "prosumer" suggests, the underlying terms "map producer" and "map user" blur with the development of more types of Internet maps and online collaborative maps. Alvin Toffler (1980) coined this term to characterise the new potential for individuals to be both the producer and the consumer. Although now everyone with Internet access has the possibility to produce, add and use map contents on the web. Many of these maps are static, which remains challenging for many people because graphic communication with maps is complicated. Map symbols can refer to similar phenomena but with different meanings (see Johnson 1983). Prosumers face these challenges — and often resolve them with different degrees of success. In the context of cartographic communication models, this presentation reports results how they use graphic variables for communication.

Communication models of cartography go back to the 1960's, including the models of Moles (1964), Michael Kuzmitsch Bocharov (1966), Koláčný (1969) or Bertin, (1967). These models are directly or indirectly influenced by pioneers of semiotics and cartosemiotics theory of Ferdinand de Saussure and Charles Sanders Peirce. On this basis, cartographic scientific research became

more and more a science that studies communication and human perception. Jacques Bertin's seminal work suggests eight graphical variables for visual communication: x/y location, size, colour value, texture, colour hue, orientation and shape (Bertin 1967). The importance of distinguishing these basic graphical variables and their respective perceptual characteristics is that they help map designers to select appropriate graphical variables to ensure accurate and effective communication. The goal is the production of a visual response which best matches the communication objectives and the characteristics of available data (Goodchild 2007). MacEachren's pragmatical extension of Bertin's graphical variables (1994, 1995) considers the connection between representation and communication, which he describes in the 2D static maps. We know from cartographic communication research that the graphic variables are important in traditional cartographic production environments. However, often the aims for a map are not clear and there is a lack of clarity in communication which can be readily misinterpreted and misunderstood (e.g. the meaning of a colour symbol is missing in the map legend).

Drawing on a better empirical understanding of prosumers use of graphical variables, we aim in the larger project to improve their use of maps in communication through a framework to develop more understandable web tools. In this presentation, we first look with content analysis at how prosumers communicate through graphical variables. Second, we consider differences in the use of graphical variables created by prosumer experts and non-experts through paper & pencil drawings, an online questionnaire and guided interviews.

The findings of the study suggest that the behaviour of prosumers in relation to cartographic communication differs among them in terms of perception and production of static graphical variables (Bertin 1967). It provides confirmation of previous work that colour is the most widely used graphical variable among study participants. Age and social differences also can be observed among prosumers in their use of other graphical variables to present numerical, ordinal and nominal data types. While the internet enabled prosumers, their production of maps remains constrained by their choices. These limits can be addressed to help create more understandable and effective maps.

### **Keywords**

Cartography, Cartographic Communication, Webmapping, Graphical Variables, Collaborative Maps, Prosumer

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